FAA-D-2781
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FAA-D-2781

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION STANDARD

AIRWAY FACILITIES PERFORMANCE EXAMINATIONS, PREPARATION AND VALIDATION OF

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FOREWARD

This standard set forth practices for preparation and validation of Airway Facilities Performance Examinations. It is to be used for identification of contractor tasks required to plan, develop, and design performance examinations.

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1. INTRODUCTION

1.1 Scope. This standard sets forth the requirements for the preparation and validation of performance examinations used in the Airway Facilities Personnel Certification Program for FAA personnel. These examinations present a typical work situation in which personnel being tested perform a practical task which requires them to demonstrate the mastery of skills and "hands-on" knowledge required for the performance of their job.

1.2 Definitions. - The following definitions are pertinent to this standard.

1.2.1 Criterion referenced measurement: A measurement system which compares a student's performance against specific criteria rather than against the performance of other students.

1.2.2 Criterion test: Measures an individual performance, compared to an objective standard, as to what he must be able to do in order to successfully perform a task. Compares an individual performance to external criteria or performance standards which are derived from an analysis of what is required to accomplish a particular task.

1.2.3 Controlled pacing: The use of time limits on other restrictions during a course or examination. This characteristic reduces individualization but can be used with desirable results in diagnostic situations.

1.2.4 Criticality: Critical tasks are those that if not performed to standard would seriously affect system operation and job success. Semi-critical tasks are tasks which, if performed correctly, would lead to more effective job performance. The overall system effectiveness is not substantially degraded by failure to perform a semi-critical task correctly. A non-critical task is one that is not important to the successful performance of the job.

1.2.5 Enabling objective: A three part objective that describes the student's expected behavior. It describes the behavioral actions, the performance conditions, and the attainment standard expected of the student when he completes the task/subtask leading toward the terminal objective.

1.2.6 Examinee: The student being examined.

1.2.7 Examiner: The qualified individual who administers the examination to the student.

1.2.8 Job: The duties and tasks performed by a single worker constitute his job.

1.2.9 Job performance requirements: A list of duties and tasks essential in order to accurately perform a specific job.

1.2.10 Job sheet: An instruction sheet which provides for the individual student a list of the principal steps to be taken in doing a job in the order in which it must be done. Job sheets also provide the student with the objectives to be accomplished and list the references, equipment, and material required.

1.2.11 Job task analysis: A basic method used to obtain a detailed listing of the behavioral content of a job, including tasks, subtasks, and operations. Job analysis involves observation and dialogue with those who perform the job in order to describe in detail the variety of tasks to be performed, the conditions under which they must be performed, special tools and equipment required, the performance standard (level) necessary, and knowledge required.

1.2.12 Job task list: A list of tasks necessary to perform a job; divided into tasks requiring training and those not requiring training; derived from job task analysis.

1.2.13 Lock-out item: An examination operation which, when not performed adequately, results in total examination failure.

1.2.14 On the job training (OJT): A program of training designed specifically to train an individual in job performance tasks. OJT may take the form of formal classroom training, reading assignments, job performance...with or without supervision...and/or self-paced instructional materials or combinations thereof.

1.2.15 Personnel prerequisite: The level of knowledge and skill of the student input to the proposed training.

1.2.16 Skill: The ability to proficiently perform a job related activity which contributes to the effective performance of a task.

1.1.17 Task: A specific action taken by an individual in performing his assigned job. A task is a unit of work that has identifiable starting and ending points and results in a measurable product.

1.2.18 Training analysis: A process for proceeding from an inventory of tasks, such as that provided by a job task analysis (job task list), to an organized set of course and enabling objectives.

1.2.19 Training equipment: The hardware or software in the form of equipment, devices, system or subsystems, parts or components (actual, duplicated, simulated, or otherwise represented) and supporting materials, to be used by student/instructor personnel to achieve required skill levels.

1.2.20 Terminal objectives: A three part objective that describes the student's expected terminal behavior.

1.2.21 Training outcomes: Identify for each task or combination of tasks what the trainee is to do, under what conditions the task is to be performed, the standards that will provide a measurement of the level to which the trainee is to perform.

2. APPLICABLE DOCUMENTS.

2.1 FAA documents. The following FAA standards, specifications, and orders in effect on the date of the invitation for bid or request for proposal, form a part of this standard and are applicable to the extent specified herein.

2.1.1 FAA orders.

FAA Order 3000.6B	Training
FAA Order 3000.10A	Airway Facilities Maintenance Technical Training Program
FAA Order 3020.1	Computer Based Instruction
FAA Order 3400.3E	Airway Facility Personnel Certification Program

2.1.2 FAA specifications.

FAA-D-2494/1	Technical Instruction Book Manuscripts: Electronic Equipment, Requirements for, Part 1 - Preparation of Manuscript
FAA-D-2494/2	Technical Instruction Book Manuscripts: Electronic, Electrical, and Mechanical Equipment, Requirements for, Part II - Preparation of Reproducible (Camera-ready) Copy and Original Artwork

2.1.3 FAA standards.

FAA-STD-010	Graphic Symbols for Digital Logic Diagrams
FAA-STD-028	Contract Training Programs

2.2 Government publications. The following Government publications, of the issues in effect on the date of the invitation for bids or requests for proposal, form a part of this standard and are applicable to the extent specified herein.

2.2.1 Military standards.

MIL-STD-17	Mechanical Symbols (Other than Aeronautical, Aerospace, and Spacecraft Use)

MIL-STD-27 Designations for Electric Power Switch Gear Devices and Industrial Control Devices

2.2.2 Other government publications.

DOD 5220.22 U.S. Government Printing Office Style Manual Industrial Security Manual for Safeguarding Classified Information

2.3 American National Standards Institute (ANSI) Publications. The following ANSI publications in effect on the date of invitation for bid or request for proposal, form a part of this standard and are applicable to the extent specified herein:

ANSI X3.5 Flowchart Symbols for Information Processing

ANSI Y 10.19 Letter Symbols for Units Used in Science and Technology

ANSI Y 14.15 Electrical and Electronic Diagrams

ANSI Y 32.2 Graphic Symbols for Electrical and Electronic Diagrams

ANSI Y 32.9 Graphic Electrical Wiring Symbols for Architectural and Electrical Layout Drawings

ANSI Y 32.16 Reference Designations for Electrical and Electronic Equipment

ANSI Z210.1 Metric Practice Guide

2.4 Institute of Electrical and Electronic Engineers (IEEE) Standard. The following IEEE standard in effect on the date of invitation for bid or request for proposal, forms a part of this standard and is applicable to the extent specified herein:

255 Semiconductor Devices, Letter Symbols for

2.5 Other publications. The following publication, of the issue in effect on the date of invitation for bid or request for proposals, forms a part of this standard and is applicable to the extent specified herein:

Merriam-Webster's New International Dictionary

(Copies of this standard and other applicable FAA standards and standards may be obtained from the Contracting Officer in the Federal Aviation Administration office issuing the invitation for bid or request for proposal. Request should fully identify material desired; i.e., standard, standard, and dates. Requests should cite the invitation for bid, request for proposal, contract involved, or other use to be made of the requested material.)

(Single copies of applicable unclassified Federal and military specifications and standards may be obtained from the Naval Publications and Forms Center (NPFC), Philadelphia, which is the Department of Defense Single Stock Point (DOD-SSP) and distribution center for unclassified specifications and standards. Documents may be obtained by writing: Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120; or by calling: Area Code 215, 697-3321, Monday through Friday, from 8:00 am to 4:30 p.m. (Philadelphia time).

(Copies of the GPO Style Manual and Industrial Security Manual may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402).

(Information on obtaining copies of NASI documents may be obtained from the American National Standards Institute, Incorporated, 1430 Broadway, New York, New York 10018.)

(Information on obtaining copies of IEEE standards may be obtained from the Institute of Electrical and Electronic Engineer, 345 East 47th Street, New York, New York 10017.)

3. REQUIREMENTS

3.1 General. This standard requires the development, preparation, and validation of performance examinations. The contractor shall prepare an examination plan for FAA approval. The approved examination plan forms the basis for developing the performance examination. The performance examination shall be submitted in manuscript form for approval and validation, and in camera ready copy for final submission. The performance examination planning/development process is depicted at Appendix 1.

3.2 Examination plan. An examination plan shall be developed for each performance examination. The plan shall provide for the conduct of a job task analysis resulting in a job task lis . A training analysis will generate job performance requirements (duties and tasks essential to job performance) and corresponding training outcomes and objectives which lend themselves to criterion referenced measurement. The plan shall delineate those tasks, subtasks, and activities for which examination items (in the form of operations) will be developed. It shall establish a test outcome/objective for each operation as it relates to the categories of use of test equipment, procedures, and results. This process should assure that the training objectives outlined by the government are met. The plan shall specify a maximum time limit for the examination. The contractor shall submit the plan to the government for review and approval before proceeding with examination development.

3.3 Performance examination development. - Performance examination shall be developed as a diagnostic tool to determine the examinee's demonstrated proficiency by forcing the examinee to make actual adjustments or software program changes and evaluate system performance. Examinations vary in length according to the complexity and scope of the system/subsystem/equipment. They involve demonstrations of adjustments or software program changes with observable results and may also include the correction of introduced defects and equipment maladjustments. A series of adjustments or software program changes may be required before a measurement for accuracy is made. The system performance examination is composed of a number of major operations and suboperations in a logical sequence devoted to duties and tasks essential to overall job performance. Any operation which, if not performed properly, would seriously affect system operation and job success, is designated as critical. Failure to perform any critical operation (lockout item) adequately results in examination failure. Unsatisfactory performance in 10% or more of the total (all three categories) evaluated items constitutes examination failure.

3.3.1 Scope. The performance examination shall be comprehensive, covering not only the equipment within a system, but also the auxiliary equipment considered to be a part of the overall system. Performance examinations for software shall cover utility, support, and diagnostic programs as well as that part of operational programs, subprograms, routines, and subroutines which support the maintenance effort. Specific areas that may be covered in a performance examination include, but are not limited to, the following:

(a) Skills associated with equipment operation including associated components.

(b) Sequential operations of controls and protective components during startup, normal operation, shutdown, and abnormal or fault conditions.

(c) Analysis of abnormalities and determination of corrective action required.

(d) Safety precautions to be observed.

(e) Documentation required for performing maintenance.

(f) Use of special tools and test equipment.

(g) Criteria for removal, disassembly, inspection, evaluation and repair or replacement of system components.

(h) Testing requirements and procedures.

(i) Sequence and standards for reassemble and checkout.

(j) Knowledge and use of technical documentation.

3.3.2 Source material. Source material for development of the performance examination shall include, but not be limited to, prototype systems, systems specifications, systems handbooks, manufacturer's technical documents, available FAA Academy training plans, course and lesson outlines, course examinations, and documented training objectives. Where applicable the Government will provide reasonable access to the system or equipment to be covered by the examination for job task analysis, and access to personnel with knowledge of the equipment in order to conduct interviews.

3.4 Performance examination design. The performance examination shall be designed such that it shall specify criterion activities by which the correct accomplishment of the objective being measured can be recognized. Criterion referenced measurements, achievable in a field or shop setting using real equipment, are desirable. The correct behavior or its consequences will be unequivocably recognized or measurable. The level of attainment required will be specified in terms of a criterion performance ability rather than a norm reference level. The training objective will provide the basis for determining a passing score.

3.4.1 Composition. A sample performance examination is depicted at Appendix 2. Performance examinations shall be standardized in composition as follows:

(a) The performance examination is prefaced in all cases by a blank cover page, FAA Form 3400-4(3-72).

(b) The cover page is followed by a standardized 2 page "Instructions To The Examiner".

(c) The instructions are followed by a page which addresses general system information as it applies to the examination. It specifies the major system covered in the examination and breaks the examination into sections by subsystem. Additional information such as a breakdown of total examination time by subsystem/section and a listing of obsolete performance examinations superceded by the referenced performance examination may be presented.

(d) Each section of the performance examination consists of a listing of operations and suboperations for the step by step administration of the examination. Each operation has a corresponding space for listing appropriate references and for operation evaluation with regards to use of test equipment, procedure, and results. When no evaluation is required for a specific operation, an X indicates no entry necessary. Otherwise, an entry of S (Satisfactory) or UNS (Unsatisfactory) will be made.

(e) In listing operations, only words with precise meanings (working language) shall be used.

3.4.2 Style of writing. The language used in constructing operations for the performance examination shall be free of vague and ambiguous terms, and use the simplest words and phrases which will convey the intended meaning. Sentences shall be short and concise. Punctuation shall be used in a manner which aids in reading and prevents misreading; well-planned word order requires a minimum or punctuation. When extensive punctuation, or chain clauses, or both, seem necessary for clarity, the sentence shall be written. The U.S. Government Printing Office Style Manual shall be used as a general guide for capitalization, punctuation, compounding of work, numerals in the text, and spelling of nontechnical words. For spelling of nontechnical words not found in the GPO Style Manual, Merriam-Webster's New International Dictionary shall be the guide. Words having more than one meaning that would fit the context used, such as "replace" for reinstall," shall not be used. Statements concerning individual items or equipment shall use specific serial number(s), block designation(s), specific model designation(s), or similar identification. Such terms as "on later equipment," or "on earlier serial numbers" shall not be used. Abbreviations shall not be used.

3.4.3 References. The text of items shall show:

(a) Temperature readings as calibrated on the equipment, with equivalent on the other scale (Fahrenheit or Celsius) following in parentheses.

(b) Speed, distance, and meter reading as calibrated on the equipment. If specified, conversion of U.S. measurements to the international system 9S.I.) shall be made ı accordance with ANSI Z210.1.

(c) Diagrams, signs, and symbols conforming to ANSI standards (see 2.3), FAA-STD-010, MIL-STD-17, MIL-STD-27, and IEEE STD 255, as applicable.

(d) Measurements in U.S. standar units, unless metric measurements are required. When metric measurements are required, they shall conform to ANSI Z210.1.

3.4.4 Grouping. When more than one test item requires use of the same examination aid, such as a schematic, those items shall be grouped in sequence, and not scattered throughout the examination. Likewise, similar operations requiring a shutdown or disruption for servicing shall be grouped. When possible, items should be sequenced to follow the same progression of tasks that the examinee encounters on the job.

3.5 Format

3.5.1 Examination plan. The examination plan shall be prepared in a format selected by the contractor.

3.5.2 Performance examination.

3.5.2.1 Manuscript. Except as specified herein, manuscript or draft copies of the performance examination shall conform to the applicable format requirements of FAA-D-2494/1.

3.5.2.1.1 Page layout and numbering. Layout shall conserve space without lessening the clarity or usability of the material. Blank spaces shall be avoided, where possible, but layout must not result in the first line of an item being at the bottom of a page, or the last line of an item being at the top of a new page. Pages shall be numbered consecutively with Arabic numerals.

3.5.2.1.2 Operation numbering, spacing, and indentation. Operations shall be numbered sequentially with Arabic numerals, flush left. Suboperations are listed alphabetically by upper case. Text of operations shall be double-spaced, indented one space from the item number. Carryover lines shall be alined with the first word of text. Items shall be separated by three spaces, adjusting as necessary to avoid dangling beginning and ending lines.

3.5.2.1.3 Divisions. The performance examination shall be divided into sections by the developer. Sections shall be lettered sequentially on a separate page. The section designation and title shall be centered on the page.

3.5.2.1.4 Graphics. Graphics furnished for review shall be reproduced copies of artwork in a form as near final as possible. To the extent practicable, schematics will be an integral part of the examination.

3.5.2.2 Camera-ready copy. Camera-ready copy of performance examination shall be provided conforming to the applicable requirements of FAA-D-2494/2, except as specified herein.

3.5.2.2.1 Numbering, spacing, and indentation. Pages and operations shall be numbered consecutively with Arabic numerals, even if division into sections is made. Sections shall be lettered consecutively alphabetically in upper case. Conditions shall be double spaced. Operations shall be separated from suboperation and each other by a double space. Indentation shall be as specified in 3.5.2.1.2.

3.6. Key. Performance of operations in the performance examination is keyed to the reference document which outlines the proper use of test equipment, procedure, and result(s).

3.7 Instructions for the examiner. Each performance examination shall be accompanied by a set of instructions for the examiner who administers the tests. Such instructions shall include, but are not limited to, general and special instructions for the examinee, materials required, aids furnished or allowed, and time allotted.

3.8 Validation. Unless otherwise specified in the contract or order, validation will be independently performed by the Government to determine the comprehensiveness and usability of the performance examination (see 4.3.1). 90 days will be allowed for validation.

3.9 Security requirements. The performance examination will normally deal with only unclassified matter. If classified matter is dealt with, the material shall be marked and handled in accordance with DOD 5220.22, Industrial Security Manual.

3.10 Study guide. For each examination, the contractor shall develop a study guide that is composed of one or more instruction sheets which collectively provide the examinee with a summarization of the objectives to be covered and a listing of references or self-help materials such as reading assignments, study questions, problems, practical application job steps, self-test items, diagram sheets, and other supplementary information to assist in studying for the objectives to be covered in the examination.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Except as otherwise specified herein, or in the contract of purchase order, the contractor is responsible for the performance of all inspection requirements. The Government reserves the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure conformance to the requirements.

4.2 Quality program requirements. The contractor shall establish a quality assurance program to ensure that all provisions of the contract or purchase order and this standard are satisfied. The quality assurance program shall include, but not be limited to:

(a) Manuscript review for format, clarity, accuracy, readability, and ease of understanding of items.

(b) Technical review for balance, i.e., the number of operations covering an essential system/subsystem is directly proportional to the importance of that system/subsystem, in the overall performance framework of the system.

4.3 Government inspection. Material furnished in accordance with this standard shall be subject to review and approval by the Government will be made as necessary to insure that the adequacy, accuracy, and content of the examinations meet requirements. This review shall not exceed 45 days.

4.3.1 Validation. Validation of the manuscript performance examination will be performed by the Government (3.8). A validation of the proposed performance examination will be performed to determine conformance to applicable requirements of the governing documents, and the technical accuracy and adequacy of the content. The validation period shall not exceed 90 days.

4.3.2 Final review. The Government will perform a final review of the completed reproducible (camera-ready) copy and the original artwork to ensure compliance with the requirements of this standard and that the technical requirements of specifications FAA-D-2494/1 and FAA-D-2494/2 have been met. The final review will ensure that all FAA corrections have been incorporated.

5. PREPARATION FOR DELIVERY.

5.1 Packing of manuscript and art for review. The manuscript copy and art for review shall be packaged in accordance with specification FAA-D-2494/1, except as specified herein.

5.2 Packaging of camera-ready copy and original artwork. - Reproducible (camera-ready) copy and original artwork shall be packaged in accordance with specification FAA-D-2494/2, except as specified herein.

6. NOTES

This section is not applicable to this standard.

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SPECIFICATION ANALYSIS SHEET

This sheet is provided for obtaining information on the use of this specification by either Contractor or Government personnel. Recommendations should be based on actual or potential savings and advantages to the Government or users. Return of this form will be appreciated. Fold on lines on reverse side, staple closed, and mail.

SPECIFICATION NUMBER AND TITLE	CONTRACT NUMBER

SUBMITTING ORGANIZATION	ADDRESS

SPECIFICATION USED IN:

- ☐ Direct Government Contract - No: _____
- ☐ Government Subcontract - No: _____
- ☐ Other - _____

1. Has any part of the specification created problems or required interpretation?

   A. Give paragraph number and wording.

   B. Recommendations for correcting the deficiencies.

2. Comments on any specification requirement considered too rigid?

3. Is the specification restrictive? ☐ Yes; ☐ No

   If "yes", in what way?

4. REMARKS. "Attach to this form any additional pertinent data which may be of use in improving this specification. Form with attachments should be mailed together in an envelope addressed as shown on reverse side".

SUBMITTED BY	DATE